

# NCST Investigation of the Champlain Towers South Collapse

## Concluding Remarks and Next Steps

Glenn R. Bell

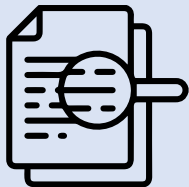
*Associate Lead Investigator*

[glenn.bell@nist.gov](mailto:glenn.bell@nist.gov)

# CTS Investigation: Concluding Remarks

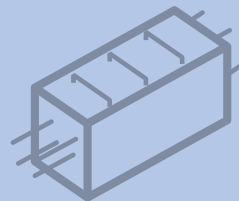


## **Theme 1: Evidence Collection, Measurements, and Visualization**



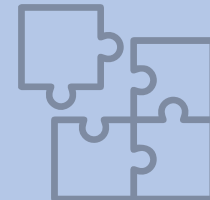
*Sissy Nikolaou, Christopher Segura, Jonathan Weigand, Emel Ganapati, Georgette Hlepas*

## **Theme 2: Materials, Geotechnical, and Structural Analysis and Testing**



*Glenn Bell, Ken Hover, Scott Jones, Youssef Hashash, and Fahim Sadek*

## **Theme 3: Failure Hypotheses Development and Evaluation**



*David Goodwin, Kamel Saidi, Judith Mitrani-Reiser, Jack Moehle, James Harris*

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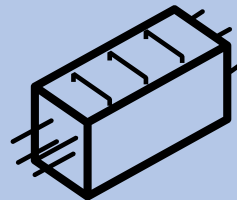


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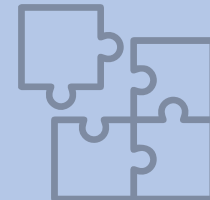
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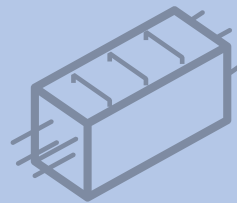


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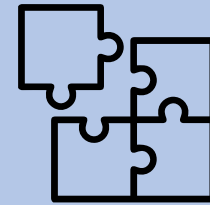
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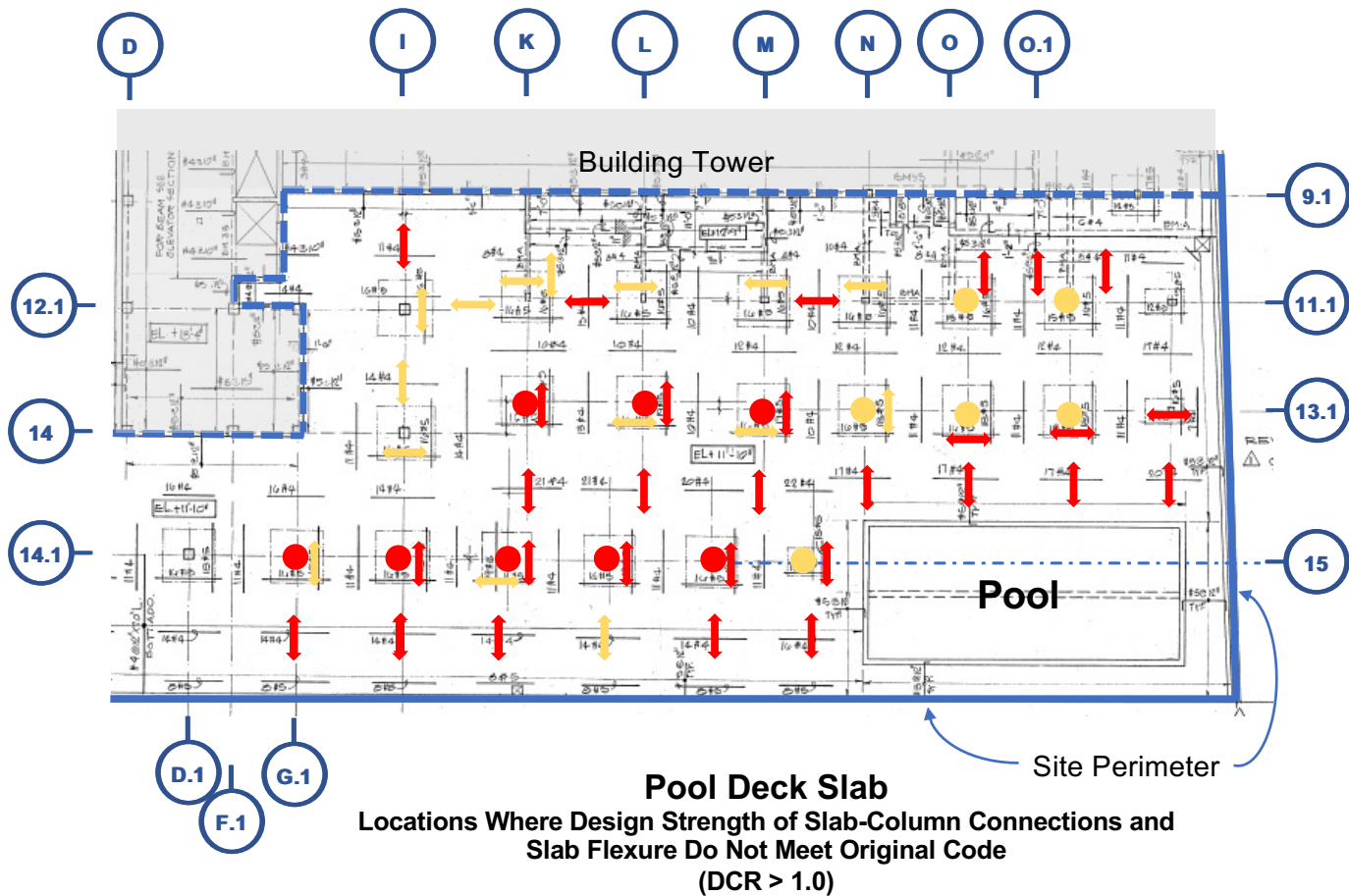
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# CTS Investigation: Preliminary Pool Deck Evaluation



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NIST

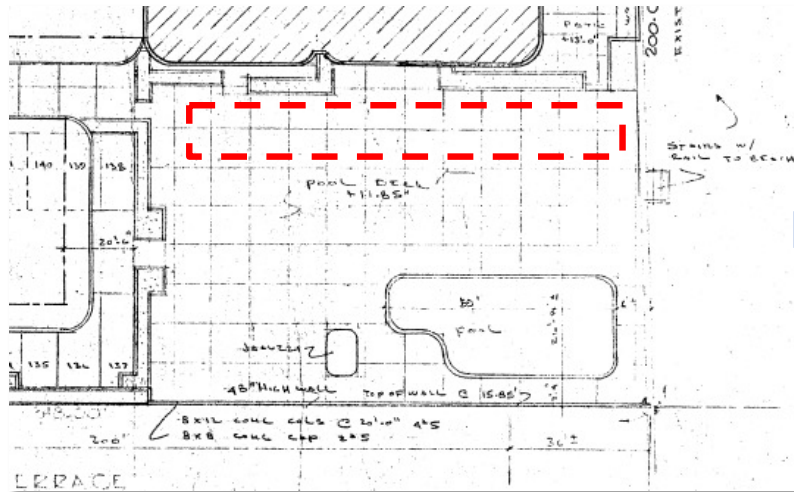
## Misplaced Slab Reinforcement



Source: NIST

# CTS Investigation: Preliminary Pool Deck Evaluation

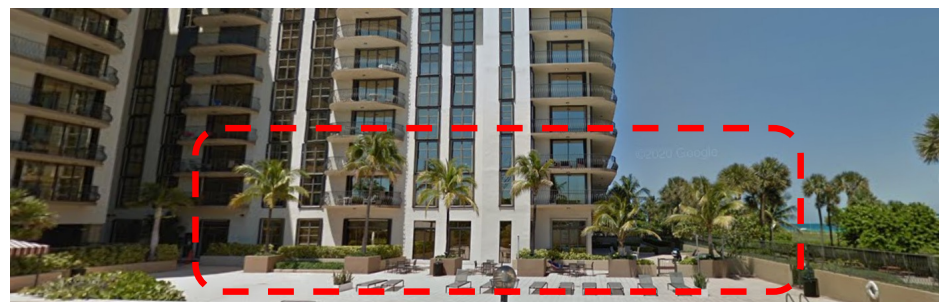
NIST



Original Architectural Drawing



Source: Google Earth image captured November 2019, downloaded May 22, 2023



Source: Google Street View image captured March 2015, downloaded May 22, 2023  
Palm Trees were Later Removed



# CTS Investigation: Preliminary Pool Deck Evaluation



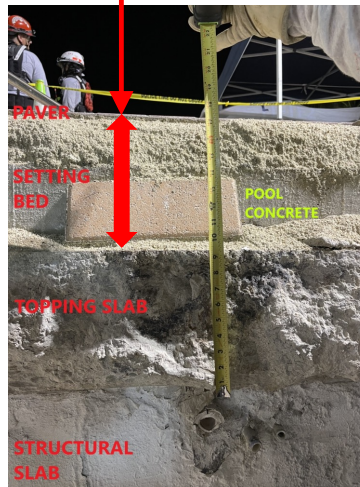
## Additional Fill and Paving

9 in. **added** sand setting bed

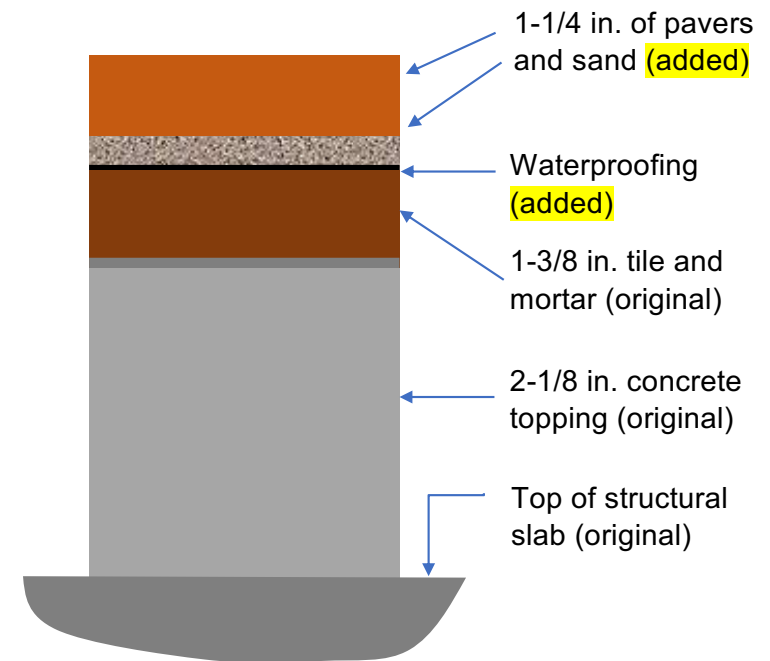


Source: Structures Specialist  
from US&R Ohio Task Force 1

approx. 9 in. setting bed  
(**some or all added**)



Source: Structures Specialist  
from US&R Ohio Task Force 1



Observations by Morabito Consultants

# CTS Investigation: Preliminary Pool Deck Evaluation

NIST

## Variability of Corrosion of Slab Reinforcement

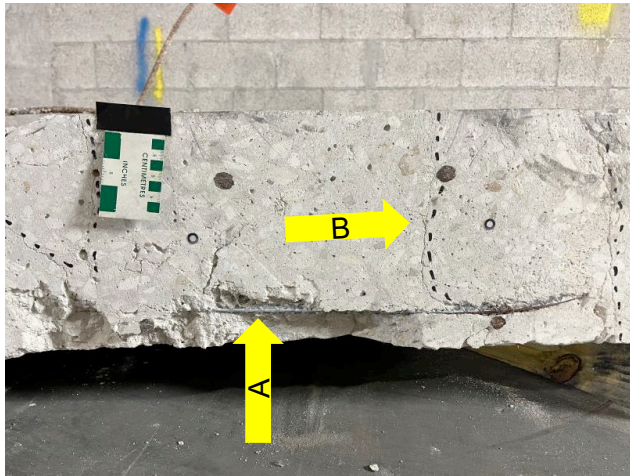


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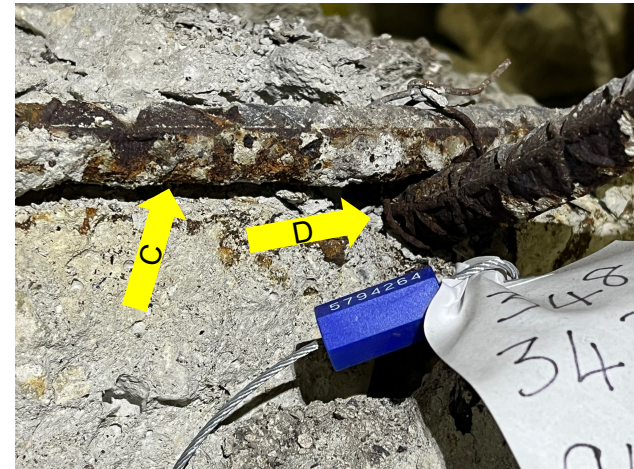
# CTS Investigation: Preliminary Pool Deck Evaluation

NIST



## Variability of Corrosion of Slab Reinforcement

Source: NIST



# CTS Investigation: Preliminary Pool Deck Evaluation

NIST

## Corrosion of Pool Deck Hooked Column Reinforcement Bars that Were Embedded into Pool Deck Slab



Enlargement of Column Top  
Showing Hooked Reinforcement  
Bars with Corrosion



Pool Deck Column Post-Collapse



Same Column in Primary Evidence Facility

Source: NIST

# CTS Investigation: Preliminary Pool Deck Evaluation

NIST

**Design Understrength**  
(largest, pervasive)

**Misplaced Slab  
Reinforcement**  
(pervasive)

**Heavier, More Extensive  
Planters**  
(near north side of pool deck)

**Added Fill and Paving**  
(variable)

**Corrosion of Slab  
Reinforcement**  
(variable, under study)

**CRITICALLY LOW MARGINS AGAINST  
FAILURE**

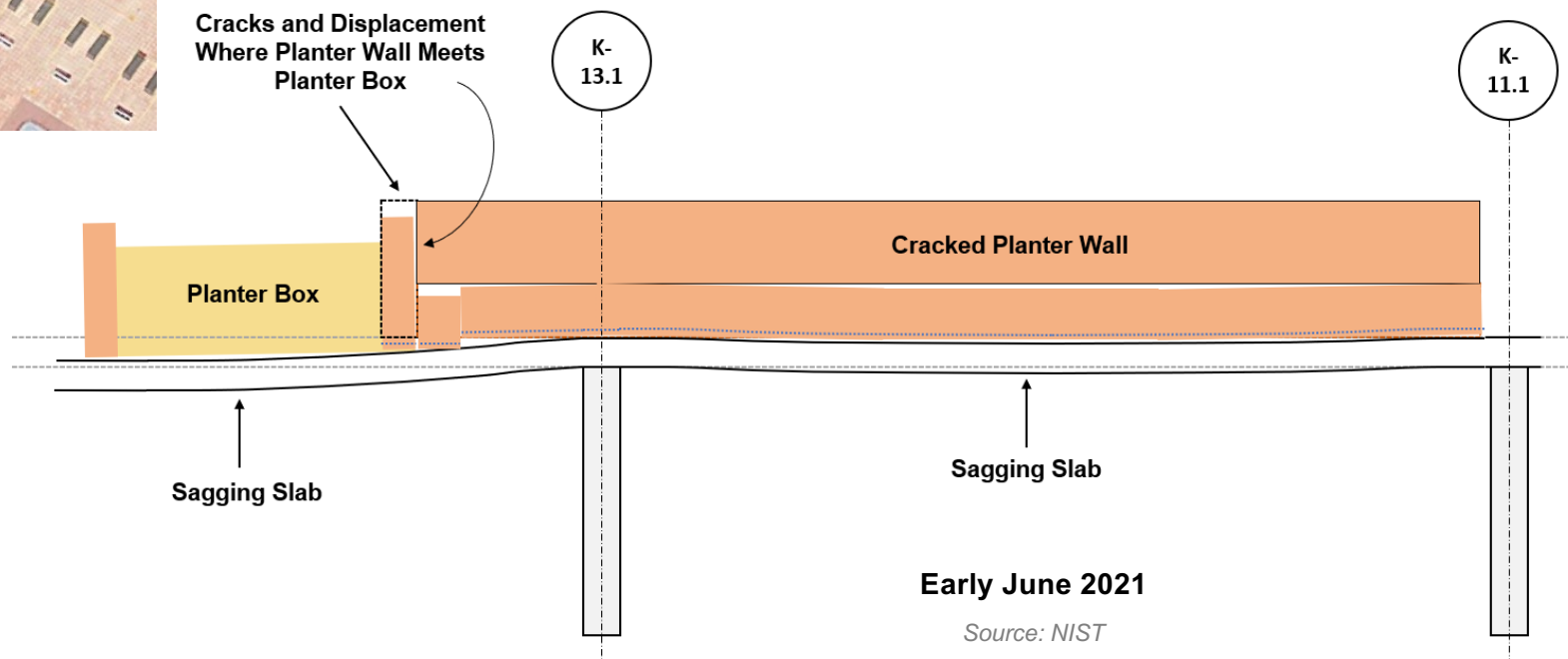


# CTS Investigation: Preliminary Pool Deck Evaluation

NIST

< Source: Google Earth image captured November 2019, downloaded June 12, 2023

## Physical Manifestation of Structural Distress



# Next Six Months - Highlights

NIST



## CTS NCST Investigation

- Advance analysis of failure hypotheses: Initiation & progression of partial collapse
- Prepare for recommendations & report writing



## Building & Code History

- Complete wind load history study
- Finalize pre-collapse conditions
- Analyze data from civil litigation



## Materials Science

- Conduct materials testing at NIST and outside labs
- Analyze concrete durability and aging
- Analyze reinforcement corrosion



## Evidence Collection & Preservation

- Manage invasive extraction of concrete cores and rebar
- Track evidence during invasive testing
- Start Phase 2 interviews



## Geotechnical Engineering

- Geotechnical support services contract
- SSI analysis with Structural Engineering
- Analysis of potential geotechnical contributors to failure hypotheses



## Remote Sensing & Data Visualization

- Complete InSAR study
- Produce detailed BIM model
- Implement specimen 3D scan database



## Structural Engineering

- Conduct structural laboratory tests
- Incorporate as-built data into models
- Extend collapse models

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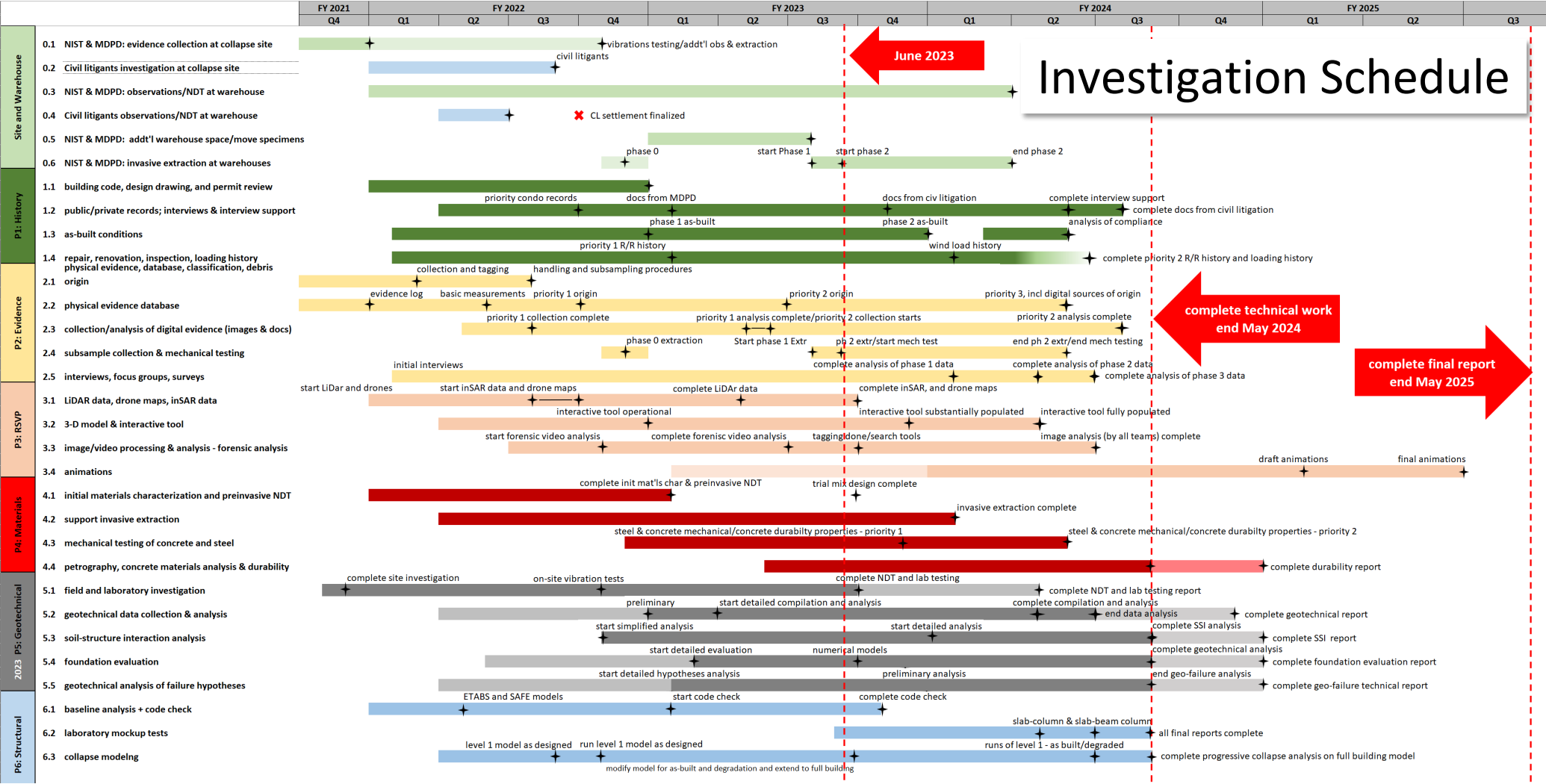
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